



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,258	09/10/2004	Giuseppe Pezzotti	P09409US00/DEJ	4864

881 7590 04/29/2009
STITES & HARBISON PLLC
1199 NORTH FAIRFAX STREET
SUITE 900
ALEXANDRIA, VA 22314

EXAMINER

RAMDHANIE, BOBBY

ART UNIT	PAPER NUMBER
----------	--------------

1797

MAIL DATE	DELIVERY MODE
-----------	---------------

04/29/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/507,258	Applicant(s) PEZZOTTI, GIUSEPPE	
	Examiner BOBBY RAMDHANIE	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) 1-16 and 29-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 17-28 and 44-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

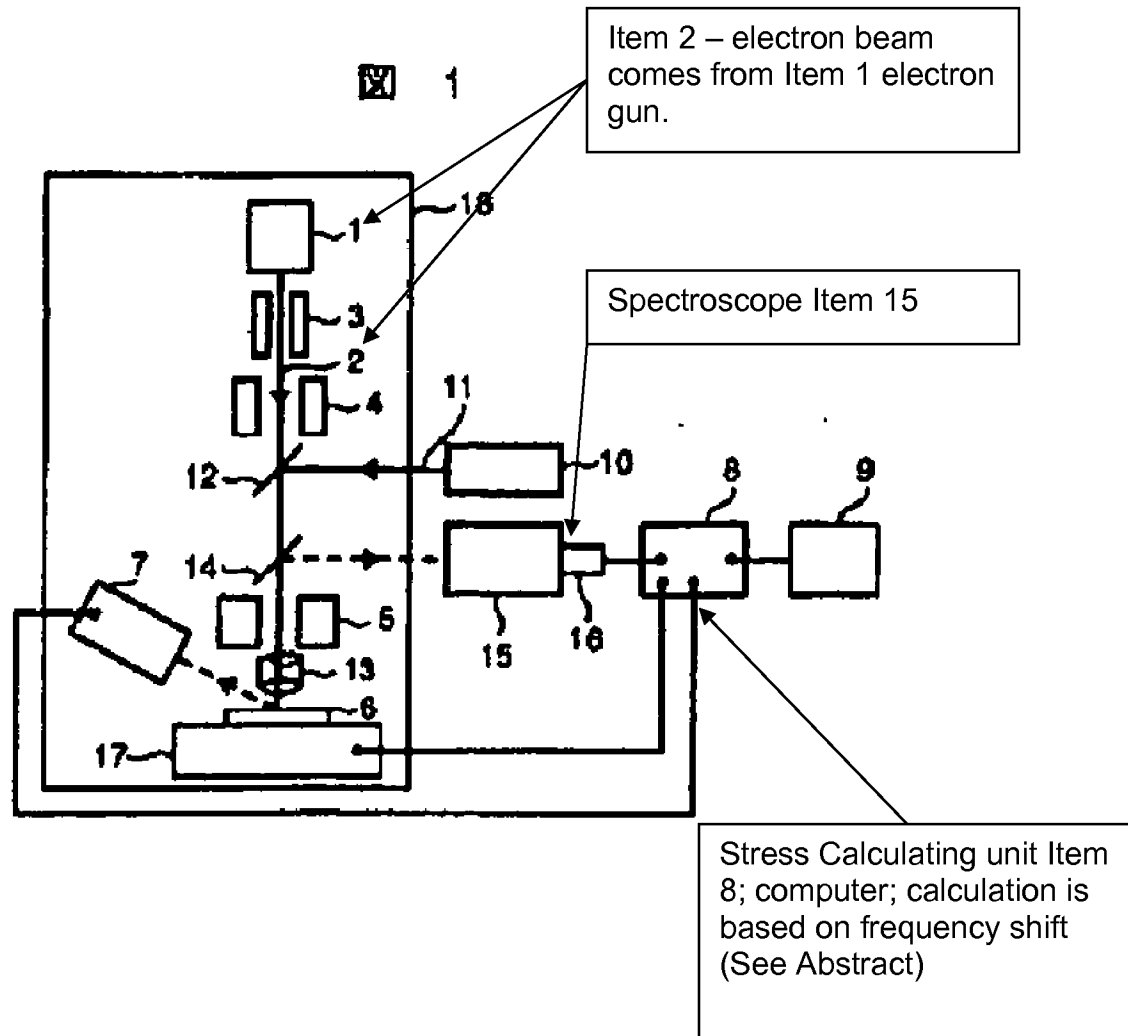
- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see remarks, filed 12/23/2008, with respect to the objections to the Drawings and Specification have been fully considered and are persuasive. The Objections of the Drawings and Specification has been withdrawn.
2. Applicant's arguments, see remarks, filed 12/23/2008, with respect to the Election/Restrictions Requirement is not persuasive. The Election/Restriction Requirement has been withdrawn using Kobayashi et al as an exemplary reference however, the common inventive concept, is known in the prior art of record.
3. Sakata et al discloses the stress measuring device comprising: A). An electron beam irradiating unit (See Abstract; electron beam/electron gun) that irradiates a specimen with an electron beam; B). A spectroscopy unit that analyzes light generated from the specimen by irradiation with the electron beam so as to obtain a spectrum of the generated light (See Abstract; Raman Spectrum requires a Spectroscopy unit & See both [0007] & [0012] & [0013]), and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state (See Abstract; frequency shift value at each scanning point by a computer [0013]). Figure 1 of Sakata et al is labeled to show how the Examiner is interpreting this reference so the record is clear and easy to comprehend.

Art Unit: 1797



5. If the prior art of record discloses the common inventive concept, the device (either in the original claim set or the newly amended claim set), the restriction requirement is still deemed valid, is maintained as being FINAL.

Response to Amendment

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant's claim is toward a device. It is unclear how the newly amended claim, to provide a minute sample from a spectrum, further limits the structure of the device.

8. Claims 22 & 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant's claim is toward a device. The relationship between the stress measuring device and the composition analyzing and visualizing units, is unclear.

9. Claims 52 & 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant's claims are toward a device. The specimen is not positively recited as being part of the system. It is unclear how a limitation that is not positively recited to be part of the system, further limits it.

10. Claims 17-28 & 44-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter

Art Unit: 1797

which applicant regards as the invention. Applicant's claim is toward a device. The relationship between the components is unclear. There is no structure to the device other than listing components.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 17, 18, 20-24, 27, 28, 44, & 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakata et al (JP07-019969).

13. Applicant's claims are toward a device.

14. Regarding Claims 17, 18, 20-24, 27, 28, 44, & 56, Sakata et al discloses the stress measuring device comprising: A). An electron beam irradiating unit (See Abstract; electron beam/electron gun) that irradiates a specimen with an electron beam; B). A spectroscopy unit that analyzes light generated from the specimen by irradiation with the electron beam so as to obtain a spectrum of the generated light (See Abstract; Raman Spectrum requires a Spectroscopy unit & [0013]), and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state (See Abstract; frequency shift value at each scanning point by a computer [0013]).

Art Unit: 1797

15. Additional Disclosures Included: Claim 18: The stress measuring device as claimed in claim 17, wherein stress calculating unit is to obtain a residual stress based on a spectrum shift between a specimen spectrum as being a spectrum in a state that no stress exists in the specimen and a stress impressed spectrum as being a spectrum in a state that a residual stress exists in the specimen (See Rejection to Claim 17; the system is capable of performing the method; there are no further positive structural limitations recited in this claim); Claim 21: The stress measuring device as claimed in claim 1, wherein a minute amount of sample from the spectrum is further provided (See Rejection to Claim 17; the system is capable of performing the method; there are no further positive structural limitations recited in this claim to the device. Further, Sakata et al discloses sample 6); Claim 23: The stress measuring device as claimed in claim 17 wherein an external light irradiating unit that irradiates external light whose spectrum is known is further provided (See Figure 1 Item 10; Light Source); and Claim 24: The stress measuring device as claimed in claim 17 wherein a visualizing unit that visualizes a portion to be measured of the above-mentioned specimen is further provided (See Figure 1 spectroscope and image processing system & [0007]); Claim 27: The stress measuring device comprising: A). A light irradiating unit that irradiates a specimen with irradiating light (See Figure 1 Item 1 electron gun); B). A spectroscopy process unit that analyzes light generated from the specimen spectrum by the irradiating light process so as to obtain a spectrum of the generated light (See Figure 1 Item 15 & 16 spectroscope), and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained when the

Art Unit: 1797

specimen is in a predetermined state and when the specimen is in a state different from the predetermined state (See Figure 1 Item 8; computer) wherein the light irradiating unit includes a broad area light irradiating device that irradiates the irradiating light on a broad area that is broad compared with a smaller spot size of the irradiating light that is narrowed down to obtain a requested space resolution, and wherein in the above-mentioned stress calculating unit, a spectrum obtained by analyzing light generated from the specimen by the broad area irradiating light is the spectrum in the predetermined state where no stress exists in the specimen (See Figure 1 Item 10; the light source is capable of irradiating a broad area; note: the objective lens which is used to focus the beam to a smaller spot); Claim 28: A stress measuring device comprising: A). A light irradiating unit that irradiates a specimen with irradiating light, B). A spectroscopy unit that analyzes light generated from the specimen by the irradiating light so as to obtain spectrum of the generated light, and a stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state, wherein the mentioned light irradiating unit includes a broad area light irradiating device that irradiates the irradiating light on a broad area that is broad compared with a smaller spot size of the irradiating light that is narrowed down to obtain a requested space resolution with scanning of the smaller spot-size, and wherein in the above-mentioned stress calculating unit, an average of spectra of the generated light in the broad area is the spectrum in the predetermined state where no stress exists in the specimen (See

Art Unit: 1797

rejections for Claim 27); and Claim 44: A system for measuring stress in a specimen with an electron beam comprising: A). An irradiating unit for providing an electron beam to irradiate the specimen; B). A measuring unit for providing measurement signals of the radiation from the specimen after irradiation with the electron beams; and C). A calculating unit for calculating the stress on the specimen from the measurement signals by determining a spectrum shift between a first spectrum of the radiation when the specimen is in a predetermined reference state and a second spectrum of the radiation measured at a predetermined measurement position on the specimen (See Rejection to Claim 17 above); and Claim 56: The system as claimed claim 44 further including a light radiating unit for illuminating the specimen with light and a light measuring unit for measuring radiation from the specimen after contact with the light radiation to provide a peak reference for compensation of the electron beam calculated stress (see Sakata et al; Item 10 and Items 15 & 16).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. Claims 19, 20, 25, 26, 47-53, & 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakata et al in view of Pezzotti, 1999.

19. Applicant's claim is toward a device.

20. Regarding Claims 19, 20, & 51 Sakata et al discloses the stress measuring device as claimed in claim 17, except wherein an external force impressing unit that applies an external force to the specimen is further provided. Pezzotti (1999) discloses a stress measuring method which includes an SEM (See figures "SEM pictures" indicate an SEM was indeed used at some point in the method) and also includes

Art Unit: 1797

Raman spectroscopy and also an external force impressing unit that applies an external force to the specimen which it further provided (See Figure 2).

21. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Sakata et al with the external impressing force unit of Pezzotti because LSI components (Large Scale Integrated circuit chips) are commonly made out of ceramic materials such as silicon nitride.

22. Additional Disclosures Included: Claim 20: The stress measuring device as claimed in claim 19, wherein and characterized by that the stress calculating unit is to obtain an internal stress from a spectrum shift between an internal stress impressed spectrum in a state that the internal stress is generated in the specimen by the external stress impressing unit and the above specimen spectrum or the stress impressed spectrum (See Pezzotti, Page 870); and Claim 51: The system as claimed claim 44 wherein the specimen to be measured includes a predetermined material that can be activated by the electron beam to emit radiation (See Pezzotti; Figure 1).

23. Regarding Claims 25 & 57, Sakata et al discloses the stress measuring device as claimed in claims 17 & 44 respectively wherein a diameter of a beam spot of an electron beam irradiated by the electron beam irradiating unit is observed (See Figure 1). Sakata et al does not disclose that the beam spot is not more than 100 nm or a diameter of 10 mn or less.

Art Unit: 1797

24. Sakata et al does however disclose a number of optical components to shape the electron beam including a condensing lens, and a deflecting coil, and also an objective lens.

25. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify beam spot of the electron beam irradiating unit to be not more than 100 nm in diameter since the resolution of the microstructures of the SEM photos in Pezzotti are no more than 100 nm and 10 nm or less (See Figure 1).

26. Regarding Claims 26, 47, & 48, Sakata et al discloses the stress measuring device as claimed in claim 17 except wherein the electron beam irradiating unit is explicitly recited as a scanning microscope. Sakata et al does however disclose an imaging system, detectors and an electron beam irradiating unit (See [0007] spectroscope & scanner which scans an electron ray).

27. Pezzotti discloses the use of an SEM to visualize stress microstructures (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the SEM into the device of Sakata et al, to be able to correlate directly SEM images with the Rama Spectrum obtained simultaneously without moving the sample from one device to the other to obtain the spectrums and thus introduce additional stress onto the sample.

28. Regarding Claim 49, the combination of Sakata et al and Pezzotti disclose the device of Claim 47, except wherein the stress force is applied thermally to the

Art Unit: 1797

specimen. It would have been obvious to one of ordinary skill in the art to apply a thermal stress force to the LSI component because it is well known in the art of electronics that LSI components develop failure at temperatures above their optimum working conditions.

29. Regarding Claim 50, the combination of Sakata et al and Pezzotti disclose the device of Claim 47 except wherein the predetermined reference state is measured over a plurality of different stress forces to correlate the amount of external force and the corresponding spectrum shift.

30. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device to include the plurality of different stress forces wherein the predetermined reference state is measured because LSI components expand and contract depending on their environment that they are in which involves a plurality of different forces acting on the component at one time (heat, cold, torsional strain, compression, expansion, etc).

31. Regarding Claims 52 & 53, the combination of Sakata et al and Pezzotti disclose the system as claimed in claim 51, except wherein the predetermined material includes at least one element from a lanthanoid series of elements or wherein the ratio of the lanthanoid element to the specimen is within a range of 1 ppm to approximately 10000 ppm.

32. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device to include the specimen with to include a specimen with these limitations because LSI components are commonly made with

Art Unit: 1797

lanthanoid elements and depending on the structure and desired properties, contain the range of 1 ppm to approximately 10000 ppm.

33. Claims 45, 46, 48, & 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakata et al in view of Pezzotti, 1999.

34. Applicant's claims are toward a device.

35. Regarding Claim 45, Sakata et al discloses the system as claimed claim 44 except wherein the first spectrum of the predetermined reference state is determined by the calculating unit by averaging a plurality of measurements across the specimen to approximate a stress-free state for the specimen. Pezzotti discloses the first spectrum of the predetermined reference state is determined by the calculating unit by averaging a plurality of measurements across the specimen to approximate a stress-free state for the specimen (See Page 870 whole page). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculating unit (computer) with the algorithm of Pezzotti since it is common practice to automate mathematical algorithms in experimental studies so that they are carried out by computers.

36. Regarding Claim 46, Sakata et al discloses the system as claimed in claim 45 wherein the irradiating unit directs the electron beam to enable a plurality of measurements representative of an area of the specimen. Sakata et al does not disclose that the area of the specimen is approximately 100 times as large as or larger than the predetermined measurement position.

Art Unit: 1797

37. Sakata et al does however disclose that the specimens are indeed macroscale (LSI components).

38. It would have been obvious to one of ordinary skill in the art to operate the device to obtain measurements of a plurality of measurements of an area of the specimen wherein the area of the specimen is approximately 100 times as large or larger than the predetermined measurement position as a design choice to obtain a desired sized image of the specimen.

39. Additional Disclosures Included: Claim 48: The stress force is applied mechanically to the specimen (See Pezzotti Figure 2).

40. Regarding Claim 55, Sakata et al discloses the system as claimed claim 44 except for further including a temperature control unit for controlling the temperature of the specimen during the measurement to a predetermined temperature. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Sakata et al to include this feature because irradiating surface with one light source will generate heat, but irradiating the specimen with an additional light source would require cooling to prevent expansion of the microstructures or stress fractures caused by the irradiation heat.

Telephonic Inquiries

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BOBBY RAMDHANIE whose telephone number is (571)270-3240. The examiner can normally be reached on Mon-Fri 8-5 (Alt Fri off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. R./

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797